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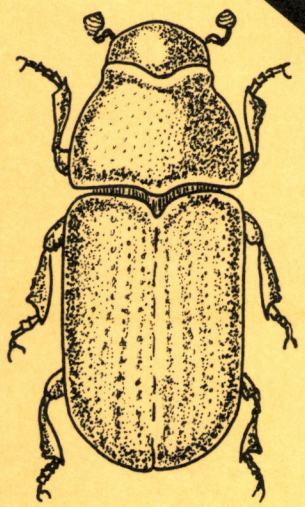

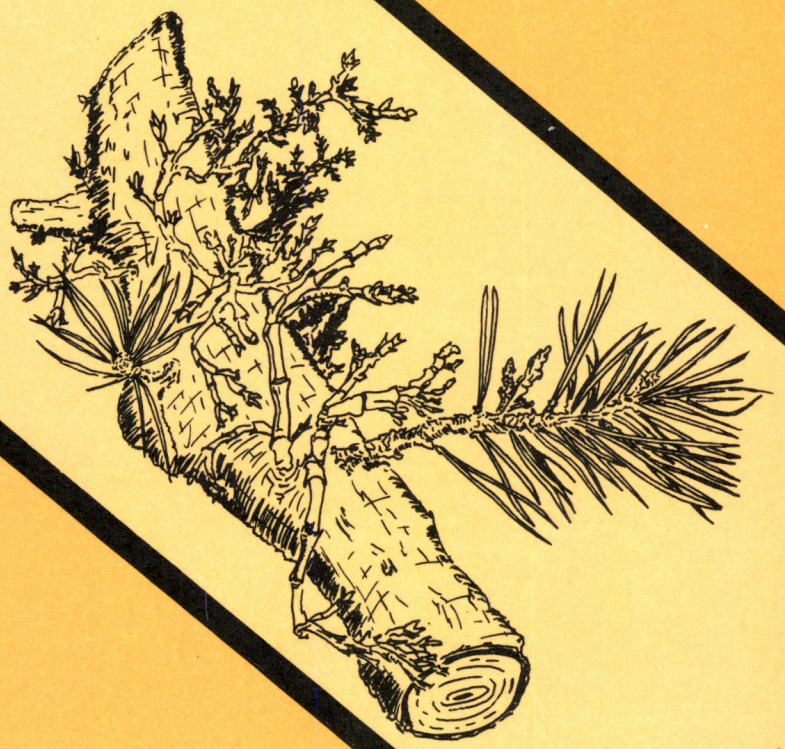

Southwestern Region

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BIOLOGICAL EVALUATION
Cottonwood Mortality

National Park Service
Big Bend National Park
Texas

1972

Branch of Forest Insect and Disease Management
Division of Timber Management
Southwestern Region, USDA, Forest Service
517 Gold Avenue, SW
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INTRODUCTION

On May 10, 1972, Bob Loomis and Don Lucht, plant pathologist and entomologist, respectively, in the Forest Insect and Disease Management Branch; Tom Ela, Supervisory Park Ranger, Santa Fe; and Dr. Stuart Lyda, Associate Professor, Texas A&M University College of Agriculture; examined dead and declining trees in the Rio Grande Village campground at Big Bend National Park, Texas. This decline and mortality was most evident in cottonwood; however, a few ash and sycamore trees were also affected. The cause(s) of the problem, and some general tree maintenance procedures which may reduce mortality in the area, are discussed in this report.

HISTORY

Cottonwood mortality and decline has been a problem in the Rio Grande Village camping area, Big Bend National Park, since 1957. At that time, an expanded tree planting program began on approximately 300 acres of irrigated land formerly planted with cotton. Of the approximately 15,000 cottonwood, sycamore, ash, redbud, walnut, and locust trees originally planted in 1957-59, 9,000 have since died. Park Service land managers have indicated that most of these were eastern cottonwood,[1/] which are reported to be highly susceptible to Phymatotrichum root rot and Cytospora canker.[2/ 3/]

In November 1966, the causes of cottonwood decline and mortality (Fig. 1) were investigated. Phymatotrichum omnivorum, a virulent southwestern tree and plant root pathogen, was reported in the area. This report was based on the presence of tan spore mats, typical of P. omnivorum, growing in approximately 80 percent of the 20 to 30 post holes dug earlier throughout the campground. More recently, Park personnel report that approximately 350 trees, mostly eastern cottonwood, have died over the past 4 years. The cause of this present and past mortality has been attributed to Phymatotrichum root rot and irrigation problems.

1/ Some of these trees were probably a variety of Populus balsamifera (= Populus candicans); however, the specific name of these trees is still being investigated.

2/ Tex. Agr. Exp. Sta. 1936. A rating of plants with reference to their relative resistance or susceptibility to Phymatotrichum root rot. Tex. Agr. Exp. Sta. Bull. 527. 52 p.

3/ Boyce, J. S. 1961. Forest pathology, 3rd edition. New York, Toronto, London: McGraw-Hill Book Co., Inc. 572 p.

Fig. 1.--Cottonwood decline and mortality, November 1966.

Fig. 1.--Cottonwood decline and mortality, November 1966.

METHODS

Trees of all species were examined throughout the 300-acre campground; however, this was not a statistically based survey. Samples of branch cankers were collected for laboratory identification of the causal organism, and a note was made of the extent and origin of these cankers. The roots of two declining cottonwood trees were examined for evidence of rot. In addition, the area was examined for other signs of Phymatotrichum root rot.

RESULTS

Practically all of the present decline and mortality (Fig. 2) is now occurring on cottonwood. Abundant orange cirri (spore masses) (Fig. 3) were noted to be associated with cankers on an estimated 70 to 80 percent of these trees. Dr. Lyda identified the causal organism of this canker disease as Cytospora chrysosperma. No fruiting was noted to be associated with cankers on declining sycamore and ash trees. While most of these cottonwood cankers were very large, and had poorly defined margins, many appeared to originate at old branch stubs or pruning wounds. No evidence of Phymatotrichum root rot was noted on the two trees whose roots were examined. In addition, no tan spore mats were found anywhere in the campground.

DISCUSSION

Much of the present mortality appears to be attributable either wholely, or at least in part, to Cytospora canker. The past and present role of Phymatotrichum root rot, as a direct or contributing cause of mortality, remains unclear. Boyce[4/] states that in the Southwest, eastern cottonwood is highly susceptible to Cytospora canker, but Valley or Rio Grande cottonwood is resistant. Local experience at Big Bend National Park indicates that Palmer cottonwood may also be resistant. The fungus is a normal inhabitant of poplar, willow, and ash bark. It may become parasitic if the host is weakened by neglect or drought, and also among trees that have been wounded. Most serious damage has been done to cuttings in nurseries and plantations.

4/ Ibid.

Fig. 2.--Cottonwood decline and mortality, November 1971.

Fig. 3.--Cirri of Cytospora chrysosperma on cottonwood, May 1972.

Fig. 2.--Cottonwood decline and mortality, November 1971.

Fig. 3.--Cirri of Cytospora chrysosperma on cottonwood, May 1972.

We have found no Cytospora canker control procedure which has proven to be successful in situations similar to the one found at Big Bend National Park. In fact, the susceptible eastern cottonwoods may continue to succumb, no matter how much control effort is expended. There are, however, certain general tree maintenance procedures which could prove helpful in reducing Cytospora-caused mortality. These procedures are as follows:

1. After infection has occurred, the infected parts should be removed at least 3 inches below the point of visible infection. In order to avoid transmission of the causal organism, the cutting edges of all tools should be thoroughly disinfected between cuts with 70 percent denatured ethyl alcohol. Pruning should not be done when the leaves and branches are wet, because parasitic organisms such as C. chrysosperma are easily spread under such conditions.5/ 6/

2. Because Cytospora canker usually becomes a problem only in weakened trees, the enhancement of tree vigor is an important preventive measure. Vigorous trees resist infection and heal wounds better than trees growing under stress. Thus, it is important to water and fertilize adequately.

3. Care should be taken not to wound healthy trees. Cytospora cankers can get established through wounds, especially on weakened trees. Thus, pruning, other than that necessary for the removal of infected or dead limbs, should be avoided.

Recently, the methods for treating pruning wounds, and the efficacy of wound dressings, have come under new scrutiny. In the past, pruning wounds have been commonly treated with a variety of wound dressings. These include: orange shellac, asphaltum paints, creosote paints, and commercial tree paints. It is important to remember that even under the best conditions, protection may be expected only when the dressing is re-applied once or twice a year.7/ Recent work by Shigo8/ 9/ indicates that wound dressings may be ineffective. He suggests that because healthy trees will resist infection and heal wounds quickly, it is important to emphasize this aspect of tree-wound disease control.

5/ Shannon, E. L. Control of Cytospora canker in apple trees and ornamental plants. N. Mex. State Coop. Ext. Bull. 400 H-405.
6/ Pirone, P. P. 1959. Tree maintenance, 3rd edition. New York: Oxford Univ. Press. 483 p.
7/ Ibid.
8/ Shigo, A. L. 1971. Wound dressing research on red maples. Int. Shade Tree Conf. Proc. 47: 97a-98a.
9/ Shigo, A. L., and C. L. Wilson. 1971. Are tree wound dressings beneficial? Aborists News Vol. 36, No. 8.

Thus, treating pruning wounds begins with enhancing tree vigor as discussed earlier. In addition, procedures which will help the wound heal quickly and may protect it from disease include:

1. Prune limb or branch flush with tree trunk.

2. Remove dead bark from around wound.

3. Shape wound to an elliptical form. Because callus tissue forms primarily from the sides of wounds, this procedure will stimulate callus formation and hasten wound closure.

4. Treat wound with a commercial wound dressing. Wound dressings in aerosol cans are available and are easy to use.

SUMMARY

Although we have found no proven Cytospora canker control techniques applicable to the situation at Big Bend National Park, we can suggest several general tree maintenance procedures which may reduce Cytospora canker mortality in the area. These are as follows:

1. Continue to prune out dead and dying tree branches. The cutting edges of pruning tools should either be dipped or thoroughly wiped between cuts with 70 percent denatured ethyl alcohol. This will help avoid transmission of Cytospora canker disease. In addition, diseased branches and trees should be removed from the area and burned. This will help reduce inoculum levels.

2. Continue a vigorous program of general tree care to include: adequate irrigation; adequate fertilization as determined by soil tests; proper pruning procedures.

3. Continue to replant with native trees which have grown well in the Big Bend area.

In addition, U.S. Forest Service plant pathologists will (a) attempt to confirm earlier unpublished reports that P. omnivorum is both in the soil and parasitizing tree roots at Rio Grand Village campground, (b) conduct follow-up evaluations, and (c) keep Park Service land managers informed of new or promising Cytospora canker control procedures.

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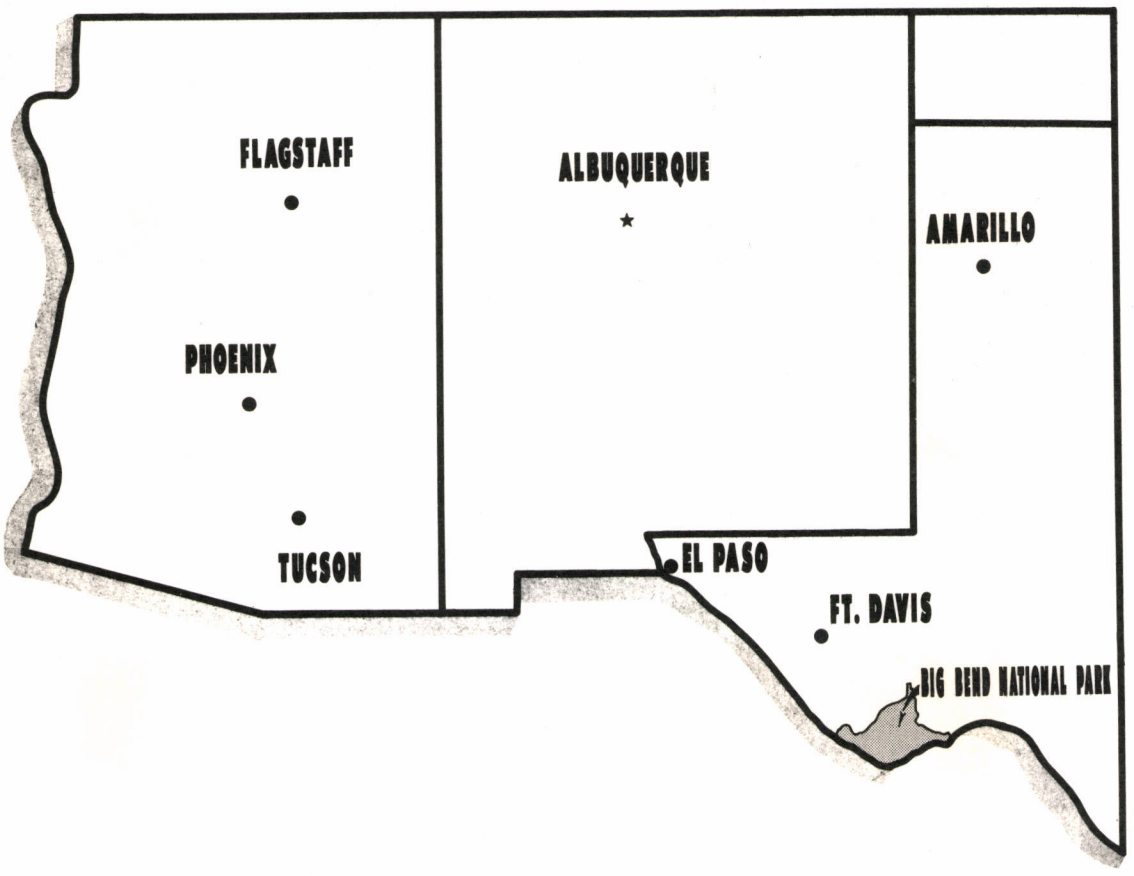

U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE, SOUTHWESTERN REGION

Additional information concerning this report or other forest insect and disease problems can be obtained by contacting the Forest Insect and Disease Management Branch listed below.

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